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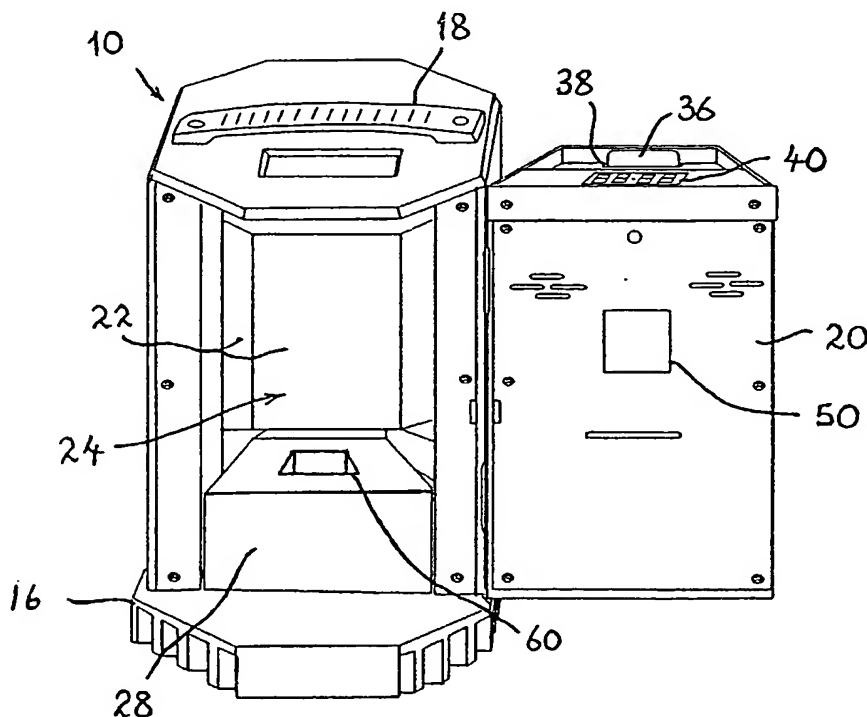
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(54) Title: SECURE TRANSPORT CONTAINER



(57) Abstract: A transport container (10) is disclosed for transporting material. The container has a chamber (24) within which the material can be disposed, the container having an openable portion (20) that can be opened to enable access to the chamber (24). The container (10) also includes sensing means (30, 34) arranged to sense attributes associated with the container (10) or the material disposed in the container and arranged to generate sensing signals in response thereto, processing means operatively connected to the sensing means (30, 34) and adapted to monitor the attributes using the sensing signals, and a data writing device (38) operatively connected to the processing means and arranged to receive a non-volatile information storage medium (36) and to write information indicative of the attributes to the storage medium (36). In use, during a transport operation, when material is disposed in the chamber (24), the storage

medium (36) is received in the data writing device (38) at a first location, and the container is transported to a second location, the information stored on the storage medium (36) provides a record of the attributes associated with the container (10) and/or the material during the transport operation. A system for and method of transporting material and ensuring compliance with predetermined criteria are also disclosed.



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SECURE TRANSPORT CONTAINER

The present invention relates to a secure transport container for transporting material and relates particularly, though not exclusively, to such a transport container for
5 transporting material such as sensitive biological materials, pharmaceuticals, documents, jewellery and military items.

In the medical field, it is often required to transport sensitive biological material such as live human cells. For example, the Autologous Chondrocyte Transplantation procedure
10 requires the transport of stem or autologous cells and blood serum from/to the patient in hospital to/from the medical laboratory where the cells undergo controlled biosynthesis or cellular replication. The transport of such sensitive biological material is regulated in a similar manner to that of certain drugs. It is essential that the biological material be transported securely without risk of damage, contamination or tampering between the
15 points of dispatch and receipt. In addition, in some instances it may also be essential that the biological material be maintained at a certain temperature in order to ensure its viability. Additionally, in some instances a secure means of auditing the transportation process for evidence of damage, contamination or tampering may be desirable.

20 The present invention was developed with a view to providing a secure transport container capable of providing a degree of quality control throughout the transport period.

It will be evident from the description that follows that the transport container in
25 accordance with the present invention may also be employed for the secure transport of other materials which require a degree of quality control during transport.

Throughout this specification the term "comprising" is used inclusively, in the sense that there may be other features and/or steps included in the invention not expressly
30 defined or comprehended in the features or steps subsequently defined or described. What such other features and/or steps may include will be apparent from the specification read as a whole.

In accordance with a first aspect of present invention, there is provided a transport container for transporting material, the container comprising:

- a chamber within which the material can be disposed;
- 5 an openable portion that can be opened to enable access to the chamber;
- sensing means arranged to sense at least one attribute associated with the container or the material disposed in the container and arranged to generate at least one corresponding sensing signal in response thereto;
- processing means operatively connected to said sensing means and adapted to
- 10 monitor the at least one attribute using said at least one sensing signal; and
- a data writing device operatively connected to said processing means and arranged to receive a non-volatile data storage medium and to write information indicative of said at least one attribute to the non-volatile information storage medium;
- whereby, in use, during a transport operation, when said material is disposed in
- 15 the chamber, said storage medium is received in the data writing device at a first location, and the container is transported to a second location, the information stored on said storage medium provides a record of the attributes associated with the container and/or the material during the transport operation.

- 20 In this way, a transport container is provided which can be used to gather data on attributes associated with the material in the container or associated with the container itself as the container is transported from a loading location to a destination location, and the gathered attributes analysed to establish compliance with relevant commercial, corporate or regulatory standards for the transportation operation in question.

- 25 Preferably, the data writing device is a read-write device arranged to read operational instructions from the data storage medium, said operational instructions causing the processing means to gather required data from at least one sensor appropriate for a particular transport operation.

- 30 Preferably, the sensing means includes means for sensing whether the openable portion has been opened during transport. The sensing means may alternatively or in addition

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include means for sensing humidity, air pressure or angle of orientation of the secure container.

Advantageously, the transport container further comprises position sensing means
5 operatively connected to said processing means for sensing the geographical position of the container, wherein said processing means periodically records the time and position of the container in said storage medium during transport. Preferably said non-volatile storage medium is in the form of a portable memory card having a non-volatile programmable electronic memory device incorporated therein.

10

Preferably said transport container is adapted to transport sensitive biological material and said chamber includes a cooled section in which said biological material is stored during transport. Preferably said sensing means includes a temperature sensor for sensing the temperature in said cooled section of the chamber.

15

Preferably said transport container further comprises a locking means for locking the openable portion of the casing in its closed condition. Advantageously said locking means is operatively connected to said processing means and can only be unlocked when a predetermined key code is received by the processing means. Preferably the
20 transport container also includes an input device operatively connected to the processing means to enable a user to input the predetermined key code to the processing means. Typically said input device is a key pad.

Preferably, the data writing device is accommodated on the transport container such that
25 the data writing device is accessible only when the openable portion is in an open position.

Advantageously said storage medium may also have the geographical coordinates of the intended final destination of the transport container recorded therein and said processing
30 means is programmed to prevent the locking means from being unlocked until said position sensing means detects that the transport container has reached its final destination.

In accordance with a second aspect of the present invention, there is provided a system for transporting material, said system comprising:

a non-volatile information storage medium; and

5 a transport container for transporting material, the container comprising:

a chamber within which the material can be disposed;

an openable portion that can be opened to enable access to the chamber;

sensing means arranged to sense at least one attribute associated with the container or the material disposed in the container and arranged to generate at least one corresponding sensing signal in response thereto;

10 processing means operatively connected to said sensing means and adapted to monitor the at least one attribute using said at least one sensing signal; and

a data writing device operatively connected to said processing means and arranged to receive the non-volatile information storage medium and to write information indicative of said at least one attribute to the non-volatile information storage medium;

15 whereby, in use, during a transport operation, when said material is disposed in the chamber, said storage medium is received in the data writing device at a first location, and the container is transported to a second location, the information stored on said storage medium provides a record of the attributes associated with the container and/or the material during the transport operation.

20 Preferably, the system further including means for reading operational instructions from the data storage medium, said operational instructions causing the processing means to gather required data from at least one sensor appropriate for the transport operation.

The system may also include means for recording said operational instructions on said storage medium. Preferably, said recording means is a computing device including a data writing device. The computing device may be arranged to gather information from a user indicative of the material to be transported, and to retrieve commercial, corporate and/or regulatory standards information appropriate for transporting the material.

Preferably, said retrieved commercial, corporate and/or regulatory standards information is used to generate said operational instructions. The commercial, corporate and/or regulatory standards information may be retrieved from a remote server.

- 5 Preferably, the system further includes comparing means for comparing the information stored on said storage medium by said data writing device with predetermined reference journey information so as to determine whether criteria appropriate for the transport operation have been met. The comparing means may include means for generating a comparison signal indicative of whether the information stored on said storage medium
10 by said data writing device is within a predetermined tolerance amount of the predetermined reference journey information.

- Preferably, the system further includes means for generating a certificate indicative of whether the information stored on said storage medium by said data writing device is
15 within the predetermined tolerance amount of the predetermined reference journey information. When the information stored on said storage medium by said data writing device is within the predetermined tolerance amount of the predetermined reference journey information, a compliance certificate is generated, and when the information stored on said storage medium by said data writing device is not within the
20 predetermined tolerance amount of the predetermined reference journey information, a fault certificate is generated. The means for generating a certificate may include a remote network enabled computing device and a printer.

- In accordance with a third aspect of the present invention, there is provided a method of
25 transporting material, said method comprising the steps of:

- providing a non-volatile information storage medium;
- providing a transport container for transporting material, the container comprising a chamber within which the material can be disposed and an openable portion that can be opened to enable access to the chamber;
- 30 sensing at least one attribute associated with the container or the material disposed in the container and generating at least one corresponding sensing signal in response thereto;

monitoring the at least one attribute using said at least one sensing signal; and
during a transport operation, writing information indicative of said at least one
attribute to the non-volatile information storage medium so as to provide a record of the
attributes associated with the container and/or the material during the transport
5 operation.

Preferably, the method further includes the steps of recording operational instructions on
said storage medium and reading said operational instructions from the data storage
medium, said operational instructions causing the processing means to gather required
10 data from at least one sensor appropriate for the transport operation.

Preferably, the method further includes the steps of gathering information from a user
indicative of the material to be transported, and using the gathered information to
retrieve commercial, corporate and/or regulatory standards information appropriate for
15 transporting the material. The retrieved commercial, corporate and/or regulatory
standards information is preferably used to generate said operational instructions. The
commercial, corporate and/or regulatory standards information may be retrieved from a
remote server.

20 Preferably, the method further includes the step of comparing the information stored on
said storage medium by said data writing device with predetermined reference journey
information so as to determine whether criteria appropriate for the transport operation
have been met. The comparing step preferably includes the step of generating a
comparison signal indicative of whether the information stored on said storage medium
25 by said data writing device is within a predetermined tolerance amount of the
predetermined reference journey information.

Preferably, the method further includes the step of generating a certificate indicative of
whether the information stored on said storage medium by said data writing device is
30 within the predetermined tolerance amount of the predetermined reference journey
information. When the information stored on said storage medium by said data writing
device is within the predetermined tolerance amount of the predetermined reference

journey information, a compliance certificate is generated, and when the information stored on said storage medium by said data writing device is not within the predetermined tolerance amount of the predetermined reference journey information, a fault certificate is generated.

5

In order to facilitate a more comprehensive understanding of the nature of the invention, a preferred embodiment of the secure transport container will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:

- 10 Figure 1 is a top side perspective view of a preferred embodiment of a secure transport container in accordance with an embodiment of the present invention;
Figure 2 is a side view of the transport container of Figure 1;
Figure 3 is a top front perspective view of the transport container of Figure 1;
Figure 4 is a top front perspective view of the transport container of Figure 1 with a side
15 wall portion open;
Figure 5 is a section view of the transport container through the line A-A in Figure 2;
Figure 6 is a bottom plan view of the base of the transport container of Figure 1;
Figure 7 is a bottom perspective view of the base of the transport container of Figure 1;
Figure 8(a) is a section view of the base of the transport container through the line A-A
20 in Figure 6;
Figure 8(b) is a section view of the base of the transport container through the line B-B in Figure 6;
Figures 9(a) and (b) are a perspective view and plan view respectively of a thermal conductor block employed in the transport container of Figure 1;
25 Figures 10(a) and (b) illustrate how vials, in which biological material is contained, are held in the thermal conductor block of Figure 9;
Figure 11 is a functional block diagram for the electronic components of the transport container of Figure 1; and
Figure 12 is a block diagram of a system for transporting material and ensuring
30 compliance with predetermined reference criteria.

Although the following description of the invention is in relation to a secure container

for use with sensitive biological materials, it will be understood that the invention is applicable to other materials such as pharmaceuticals, documents, jewellery and military items. The important aspects are that the secure container is capable of gathering data on attributes associated with the material disposed in the container, such as temperature, and/or of gathering data on attributes associated with the container itself, such as whether the container has been opened or the position of the container, and that the secure container is capable of recording the gathered data so as to provide a data record during the journey. This data record can be used to establish compliance with relevant commercial, corporate or regulatory standards.

10

A preferred embodiment of the secure transport container 10 according to the invention, as illustrated in Figures 1 to 4, comprises an outer casing 12 in the shape of an octagonal prism. The outer casing 12 has a polished aluminium finish, is 328mm high and 192mm in width. Each of the eight side walls is approximately 80mm wide. An octagonal top plate 14 is 3mm thick and the base 16, which is a machined octagonal heat sink, is 200mm wide and 25mm deep. The heat sink base is manufactured with a black anodised/chromate finish (see also Figure 6, 7 and 8). A handle 18 fixed to the top plate 14 is provided to enable the transport container to be easily carried with one hand. The outer casing 12 has an openable side wall portion or door 20 that is hinged along one edge and can pivot to an open position as shown in Figure 4.

The transport container 10 has a double wall construction, as can be seen most clearly in Figures 4 and 5 in which the inner walls 22 are visible, defining a chamber 24 within which sensitive material can be transported. The cavity between the outer casing 12 and the inner walls 22 is filled with thermal insulating material. Some of the space within the cavities is also used for housing batteries 26 used to power the electronic components of the transport container (see Figure 5). The illustrated embodiment of the transport container 10 is designed for transporting sensitive biological material, and for this purpose is provided with a cooled section 28. Sensing means are provided within the casing 12 for sensing attributes associated with the material and/or associated with the transport container 10 and for generating corresponding sensing signal(s) in response thereto.

For example, both the cooled section 28 and the space above the cooled section within the chamber 24 may each be provided with sensors arranged to sense various attributes associated with the material, such as temperature sensors 30 (see Figure 11) for sensing the temperature within the cooled section 28 and within the remainder of the chamber 24 respectively. A variety of additional sensors may be provided within the casing 12 for sensing various attributes associated with the container, including humidity, air pressure, angle of orientation of the container (tilt), etc. A sensor may also be provided for sensing when the door 20 is in an open or closed condition. Other suitable sensors may be employed depending on the application. Processing means, for example, a microprocessor-based controller 32 is provided, operatively connected to the temperature sensors 30 and other sensors 34, and is adapted to monitor the condition of the material within the container based on the sensing signals from the various sensors and, if desired, to monitor other attributes relevant to the container and/or the material.

A removable non-volatile information storage medium, in the form of a memory card 36 is provided for storing information indicative of the attributes sensed by the sensors 30, 34. A read-write device 38, operatively connected to the controller 32 is provided for reading or writing information from the memory card 36. Hence, in use, the memory card 36 can be inserted in the read-write device 38 at the point of loading the sensitive material in the chamber 24 of the container 10 and then removed at the point of unloading the sensitive material from the chamber 24 to provide a complete record of the condition of the material and, if desired, a record of other attributes associated with the material or container during the period of transport. The memory card 36 may also include data indicative of operational instructions usable by the processing means to gather the required data from the appropriate sensors for a particular transport operation.

Preferably the memory card 36 is of the so-called "smart card" variety and incorporates a non-volatile programmable electronic memory device therein. The read-write device 38 is housed within the door 20, as can be seen most clearly in Figure 4, and is only accessible when the door 20 is in its open position. In transit, the top plate 14 of the outer casing 12 covers the read-write device 38 so that the smart card 36 is inaccessible,

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thus ensuring that the smart card cannot be tampered with en route. As can also be seen most clearly in Figures 3 and 4, a visual display 40 is also provided on the top face of the door 20, and is visible through a window 42 in the top plate 14 when the door 20 is in its closed position. The visual display 40 is typically an LCD display and is
5 operatively connected to the controller 32 to provide a readout of various operating parameters for the electronic systems in the transport container 10. For example, the display could include a clock to indicate the length of time since the door 20 was sealed, a visual readout of the temperature(s) within the chamber 24, a battery voltage readout, and so on.

10

The door 20 is provided with locking means 44 for locking the door in its closed position. Preferably the locking means 44 is an electronically operated lock that is operatively connected to the controller 32. In order to unlock the locking means 44 a predetermined key code must be received by the controller 32. For this purpose, the
15 transport container 10 is preferably also provided with an input device operatively connected to the controller 32 to enable a user to input the predetermined key code to release the electronic lock 44. In the illustrated embodiment, the input device is in the form of a key pad 46 mounted on the front of the door 20.

20 In the illustrated embodiment the transport container 10 also comprises position sensing means 50 (see Figure 11) operatively connected to the controller 32 for sensing the geographical position of the container 10 and generating an attribute indicative of the position of the container 10. Controller 32 periodically records the time and position of the container 10 in smart card 36 during transport of the container 10, based on the
25 coordinates produced by the position sensing means 50. Typically the position sensing means employs a GPS receiver capable of calculating the geographical coordinates based on satellite transmissions. Hence, the smart card 36 can have recorded thereon a full record of the route taken and the time taken to transport the sensitive material from source to destination.

30

Preferably the cooled section 28 of the chamber 24 is provided with means for cryogenic storage of sensitive biological material. The material is transported in vials

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54 (see Figure 10), four of which are held in a thermally conductive block 56 in the form of an aluminium block 40 x 40 x 40mm as shown in Figure 9. A plastic or nylon cover 58 is provided to sit on top of the block 56 to cover the vials 54 as shown in Figure 10(b). A square recess 60 is provided in the bottom cooled section 28 of the chamber 24 and is adapted to receive the aluminium block 56 therein. In the base of recess 60 a Peltier cooling element 62 is provided for providing cryogenic cooling of the aluminium block 56. On one side the cooling element 62 is in thermally conductive contact with the base of the aluminium block, and on the other side it is in thermally conductive contact with the base 16 of the outer casing 12 of the transport container.

10

As can be seen most clearly in Figures 6, 7 and 8 the base 16 is formed with a plurality of cooling fins 64 so as to act as a more efficient heat sink. A fan 66 is also provided in the base 16, aligned with the cooling element 62, to provide additional heat transfer if necessary. Both the Peltier cooling element and the fan 66 are also operatively connected to the controller 52 as shown in Figure 11 and can be activated or deactivated by the controller 32 as required, based on the sensing signals received from the temperature sensors 30.

Advantageously, the smart card 36 may also have the geographical coordinates of the intended final destination of the transport container recorded therein. Controller 32 may be programmed to prevent the electronic lock 44 from being unlocked until the position sensing means 50 detects that the transport container 10 has reached its final destination. When controller 32 detects corresponding geographical coordinates, the electronic lock 44 can be unlocked by keying in the correct key code via key pad 46. Until such time as the geographical coordinates match, punching in the key code via key pad 46 will have no effect. This provides a further level of security to guarantee the safe transport of the sensitive material to its final destination.

The transport container 10 may be used to establish whether appropriate criteria associated with a particular transport operation have been met by analysing the information stored on the memory card 36 when the transport container reaches the destination location.

An embodiment of a system 70 for transporting material and ensuring compliance with predetermined criteria is shown in Figure 12. The system 70 is illustrated in relation to transportation of a secure container 10 from a loading location A to a destination
5 location B.

The system 70 includes a computing device, in this example in the form of a personal computing device 72, a read-write device 74 operatively associated with the computing device 72 for reading and writing information from and to a memory card 36,
10 communications means, in this example in the form of the Internet 76, and a web server 78.

In use, a user first operates the computing device 72 to enter information describing the nature of the material to be transported and details of the journey to be undertaken by
15 the secure container 10. This information may be gathered using predefined forms. Once the required information has been gathered, a communication is made from the computing device 72 to the server 78 requesting information indicative of the relevant commercial, corporate and/or regulatory standards applicable for the desired transport operation. In the present embodiment, the communication is sent through the Internet
20 76 to the server 78 which gathers the required commercial, corporate and/or regulatory standards information and serves the information back through the Internet 76 to the computing device 72. On receipt of the commercial, corporate and/or regulatory standards information, the computing device 72 creates a journey data file including information indicative of the required data which must be gathered by the secure
25 container during the journey in order to determine whether the required commercial, corporate and/or regulatory standards have been met during the journey. The journey data file includes operational instructions which cause the processing means of the secure container 10 to gather required data from sensors appropriate for the particular transport operation. The journey data file is then stored in the memory card 36 by the
30 read-write device 74.

The memory card 36 is then inserted into the read-write device 38 of the secure

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container 10, the material 80 to be transported is disposed in the chamber 24, and the secure container 10 is locked using the locking means 44.

5 The secure container 10 is then transported from the loading location A to the destination location B, the operational instructions in the journey data file stored on the memory card 36 being used during the journey to control operation of the processing means of the secure container 10 to gather the necessary data from the sensors provided on the secure container 10 to determine whether the applicable commercial, corporate and/or regulatory standards have been met during the journey. The data gathered from
10 the sensors is stored on the memory card 36 by the read-write device 38.

When the secure container 10 has reached the destination location B, the appropriate code for opening the door 20 is entered into the keypad 46 so as to open the door, and the memory card 36 is removed from the read-write device 38. The information stored
15 on the memory card 36 is then extracted using a suitable read-write device and forwarded to the server 78 using any suitable arrangement, for example using a personal computing device and associated read-write device connected to the Internet 76.

The server 78 then compares the required commercial, corporate and/or regulatory standards appropriate for the journey with the information extracted from the memory card 36, and using an appropriate printer (not shown) issues a Certificate of Compliance if the commercial, corporate and/or regulatory standards are within a predetermined tolerance. If the standards are not within the predetermined tolerance, a Certificate of Fault is issued to assist in identifying the point of divergence.
25

It will be understood that the above described system and method is able to provide an arrangement for independently verifying compliance with relevant commercial, corporate and/or regulatory standards during transportation without the risks, costs and potential fraudulent declarations associated with self-assessment.
30

It will be appreciated that in addition to the medical field, the present system and method is also applicable to transportation of securities, legal documents, military

components, digital media, and to transportation of any material wherein it is beneficial to establish that the material was not viewed, corrupted or interfered with during a journey. The present invention may also be deployed to monitor access into and the environment inside and outside a shipping container. In this arrangement, the data collected and the Certificate of Compliance may serve to reduce theft and establish liability.

From the above description of a preferred embodiment of the secure transport container it will be apparent that it provides a number of significant advantages, including the following:

- (i) It provides a way of maintaining quality control throughout the transport period, to ensure that sensitive biological material remains viable;
- (ii) Information concerning the condition, such as temperature and seal quality, throughout the transport period can be securely recorded on a smart card and easily retrieved at the destination;
- (iii) It provides enhanced security and traceability with strict access control throughout the transport period;
- (iv) The incorporation of position sensing means provides a further level of security and traceability;
- (v) It is fully self-contained and can be reused many times.

Numerous variations and modifications will suggest themselves to persons skilled in the relevant technical arts, in addition to those already described, without departing from the basic inventive concepts. For example, additional or alternative security measures may be incorporated depending on the nature of the sensitive material required to be transported in the transport container. All such variations and modifications are to be considered within the scope of the present invention, the nature of which is to be determined from the foregoing description.

CLAIMS:

1. A transport container for transporting material, the container comprising:
a chamber within which the material can be disposed;
5 an openable portion that can be opened to enable access to the chamber;
sensing means arranged to sense at least one attribute associated with the container or the material disposed in the container and arranged to generate at least one corresponding sensing signal in response thereto;
processing means operatively connected to said sensing means and adapted to
10 monitor the at least one attribute using said at least one sensing signal; and
a data writing device operatively connected to said processing means and arranged to receive a non-volatile information storage medium and to write information indicative of said at least one attribute to the non-volatile information storage medium;
whereby, in use, during a transport operation, when said material is disposed in
15 the chamber, said storage medium is received in the data writing device at a first location, and the container is transported to a second location, the information stored on said storage medium provides a record of the attributes associated with the container and/or the material during the transport operation.
- 20 2. A transport container as claimed in claim 1, wherein the data writing device is a read-write device arranged to read operational instructions from the data storage medium, said operational instructions causing the processing means to gather required data from at least one sensor appropriate for a particular transport operation.
- 25 3. A transport container as claimed in claim 1 or claim 2, further comprising position sensing means operatively connected to said processing means for sensing the geographical position of the container, wherein said processing means periodically records the time and position of the container in said storage medium during transport.
- 30 4. A transport container as claimed in any one of claims 1 to 3, wherein said sensing means includes means for sensing whether the openable portion has been opened during transport.

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5. A transport container as claimed in any one of claims 1 to 4, wherein said sensing means includes means for sensing humidity, air pressure or angle of orientation of the secure container.

5 6. A transport container as claimed in any one of the preceding claims, wherein said non-volatile storage medium is in the form of a portable memory card having a non-volatile programmable electronic memory device incorporated therein.

10 7. A transport container as claimed in any one of the preceding claims, wherein said transport container is adapted to transport sensitive biological material and said chamber includes a cooled section in which said biological material is stored during transport.

15 8. A transport container as claimed in claim 7, wherein said sensing means includes a temperature sensor for sensing the temperature in said cooled section of the chamber.

9. A transport container as claimed in any one of the preceding claims, wherein said transport container further comprises a locking means for locking the openable portion of the casing in its closed condition.

20 10. A transport container as claimed in claim 9, wherein said locking means is operatively connected to said processing means and can only be unlocked when a predetermined key code is received by the processing means.

25 11. A transport container as claimed in claim 10, wherein the transport container also includes an input device operatively connected to the processing means to enable a user to input the predetermined key code to the processing means.

30 12. A transport container as claimed in claim 11, wherein said input device is a key pad.

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13. A transport container as claimed in any one of the preceding claims, wherein the data writing device is accommodated on the transport container such that the data writing device is accessible only when the openable portion is in an open position.

5 14. A transport container as claimed in any one of the preceding claims, wherein said storage medium may also have the geographical coordinates of the intended final destination of the transport container recorded therein and said processing means is programmed to prevent the locking means from being unlocked until said position sensing means detects that the transport container has reached its final destination.

10

15. A system for transporting material, said system comprising:

a non-volatile information storage medium; and

a transport container for transporting material, the container comprising:

a chamber within which the material can be disposed;

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an openable portion that can be opened to enable access to the chamber;

sensing means arranged to sense at least one attribute associated with the container or the material disposed in the container and arranged to generate at least one corresponding sensing signal in response thereto;

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processing means operatively connected to said sensing means and adapted to monitor the at least one attribute using said at least one sensing signal; and

a data writing device operatively connected to said processing means and arranged to receive the non-volatile information storage medium and to write information indicative of said at least one attribute to the non-volatile information storage medium;

25

whereby, in use, during a transport operation, when said material is disposed in the chamber, said storage medium is received in the data writing device at a first location, and the container is transported to a second location, the information stored on said storage medium provides a record of the attributes associated with the container and/or the material during the transport operation.

30

16. A system as claimed in claim 15, further including means for reading operational

instructions from the data storage medium, said operational instructions causing the processing means to gather required data from at least one sensor appropriate for the transport operation.

- 5 17. A system as claimed in claim 16, further including means for recording on said storage medium said operational instructions.

18. A system as claimed in claim 17, wherein said recording means is a computing device including a data writing device.

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19. A system as claimed in claim 18, wherein the computing device is arranged to gather information from a user indicative of the material to be transported, and to retrieve commercial, corporate and/or regulatory standards information appropriate for transporting the material.

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20. A system as claimed in claim 19, wherein said retrieved commercial, corporate and/or regulatory standards information is used to generate said operational instructions.

21. A system as claimed in claim 19 or claim 20, wherein the commercial, corporate
20 and/or regulatory standards information is retrieved from a remote server.

22. A system as claimed in any one of claims 15 to 21, further including comparing means for comparing the information stored on said storage medium by said data writing device with predetermined reference journey information so as to determine
25 whether criteria appropriate for the transport operation have been met.

23. A system as claimed in claim 22, wherein the comparing means is arranged to generate a comparison signal indicative of whether the information stored on said storage medium by said data writing device is within a predetermined tolerance amount
30 of the predetermined reference journey information.

24. A system as claimed in claim 23, further including means for generating a

certificate indicative of whether the information stored on said storage medium by said data writing device is within the predetermined tolerance amount of the predetermined reference journey information, wherein,

when the information stored on said storage medium by said data writing device
5 is within the predetermined tolerance amount of the predetermined reference journey information, a compliance certificate is generated, and

when the information stored on said storage medium by said data writing device is not within the predetermined tolerance amount of the predetermined reference journey information, a fault certificate is generated.

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25. A system as claimed in claim 24, wherein the means for generating a certificate includes a remote network enabled computing device and a printer.

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26. A method of transporting material, said method comprising the steps of:

providing a non-volatile information storage medium;

providing a transport container for transporting material, the container comprising a chamber within which the material can be disposed, and an openable portion that can be opened to enable access to the chamber;

sensing at least one attribute associated with the container or the material
20 disposed in the container and generating at least one corresponding sensing signal in response thereto;

monitoring the at least one attribute using said at least one sensing signal; and

during a transport operation, writing information indicative of said at least one attribute to the non-volatile information storage medium so as to provide a record of the
25 attributes associated with the container and/or the material during the transport operation.

27. A method as claimed in claim 26, further including the steps of recording
operational instructions on said storage medium and reading said operational
30 instructions from said data storage medium operational instructions causing the processing means to gather required data from at least one sensor appropriate for the transport operation.

28. A method as claimed in claim 27, further including the steps of gathering information from a user indicative of the material to be transported, and using the gathered information to retrieve commercial, corporate and/or regulatory standards information appropriate for transporting the material.

29. A method as claimed in claim 28, further including the step of using the retrieved commercial, corporate and/or regulatory standards information to generate said operational instructions.

30. A method as claimed in claim 28 or claim 29, wherein the commercial, corporate and/or regulatory standards information is retrieved from a remote server.

31. A method as claimed in any one of claims 26 to 30, further including the step of comparing the information stored on said storage medium by said data writing device with predetermined reference journey information so as to determine whether criteria appropriate for the transport operation have been met.

32. A method as claimed in claim 31, wherein the comparing step includes the step of generating a comparison signal indicative of whether the information stored on said storage medium by said data writing device is within a predetermined tolerance amount of the predetermined reference journey information.

33. A method as claimed in claim 32, further including the step of generating a certificate indicative of whether the information stored on said storage medium by said data writing device is within the predetermined tolerance amount of the predetermined reference journey information, wherein

when the information stored on said storage medium by said data writing device is within the predetermined tolerance amount of the predetermined reference journey information, a compliance certificate is generated, and

- 21 -

when the information stored on said storage medium by said data writing device is not within the predetermined tolerance amount of the predetermined reference journey information, a fault certificate is generated.

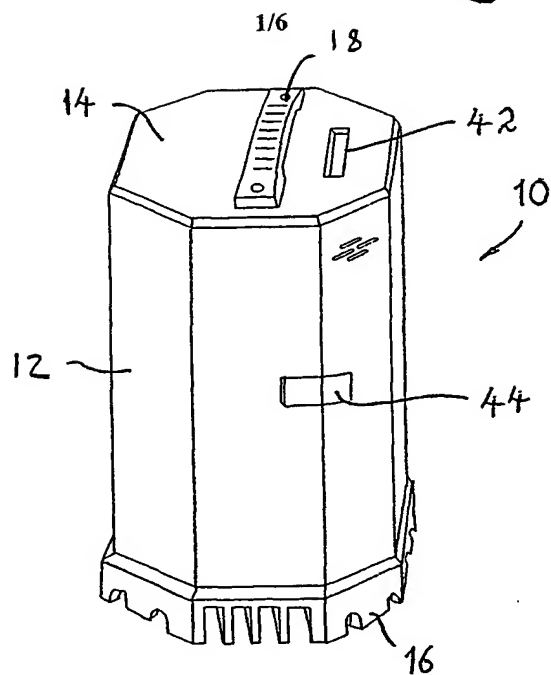


FIG. 1.

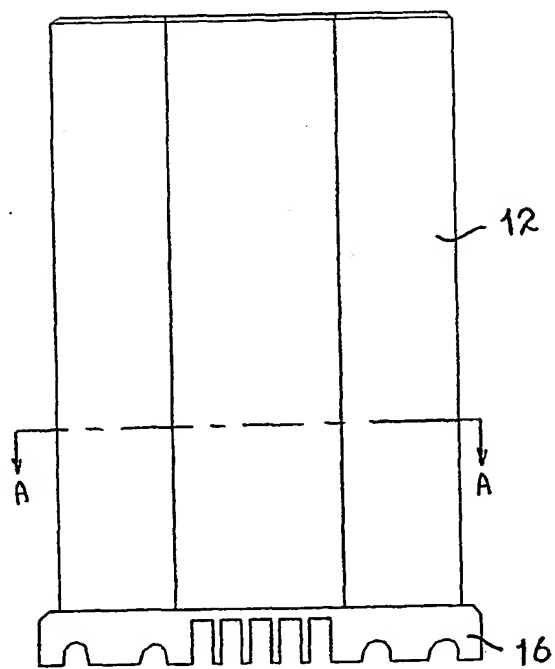
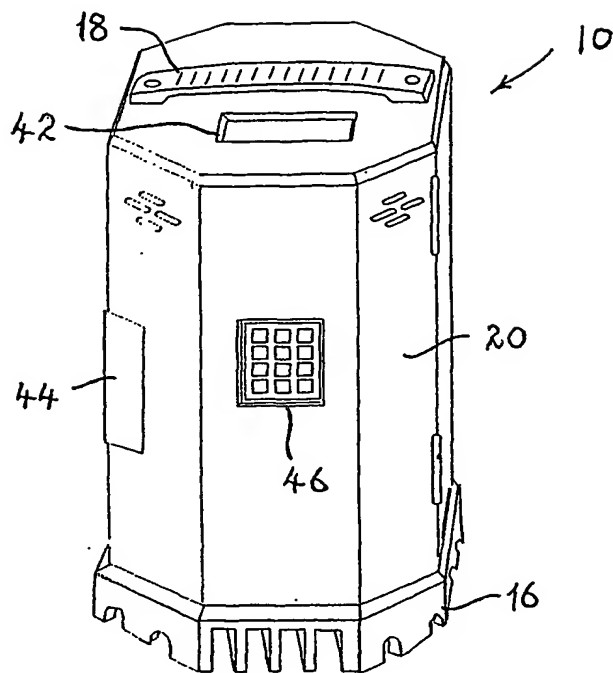
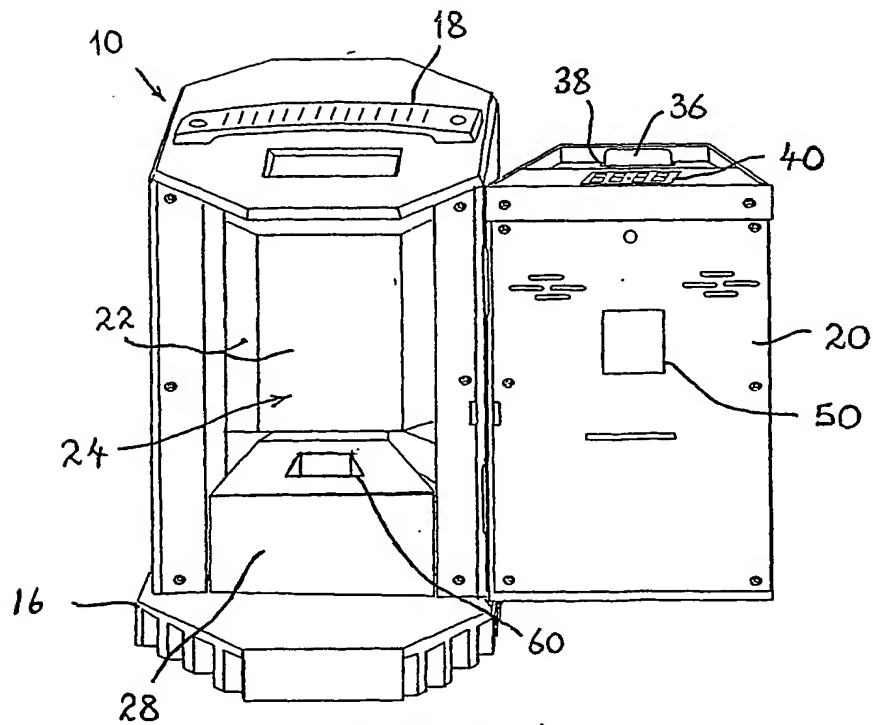


FIG. 2.

*FIG. 3.**FIG. 4.*

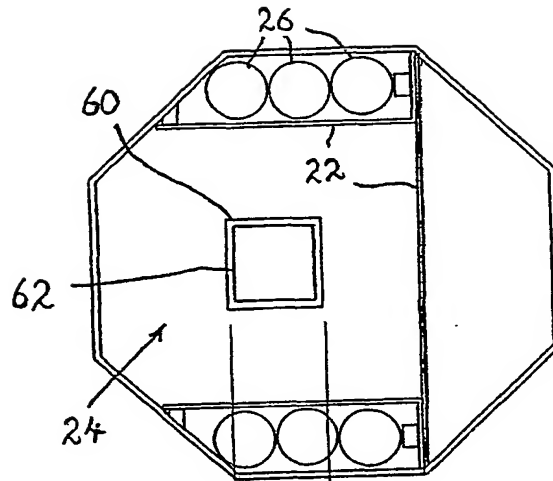


FIG. 5.

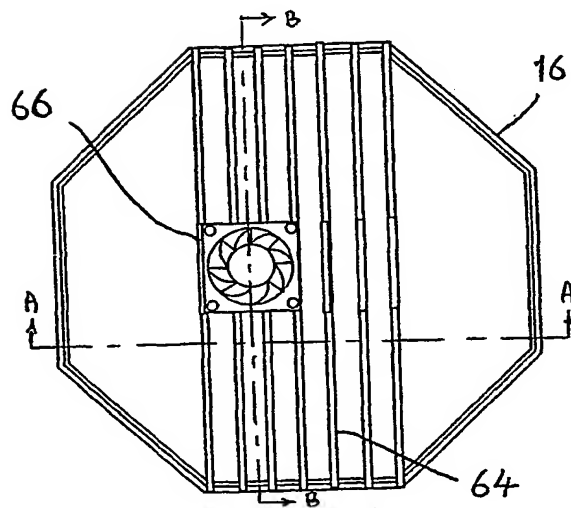


FIG. 6.

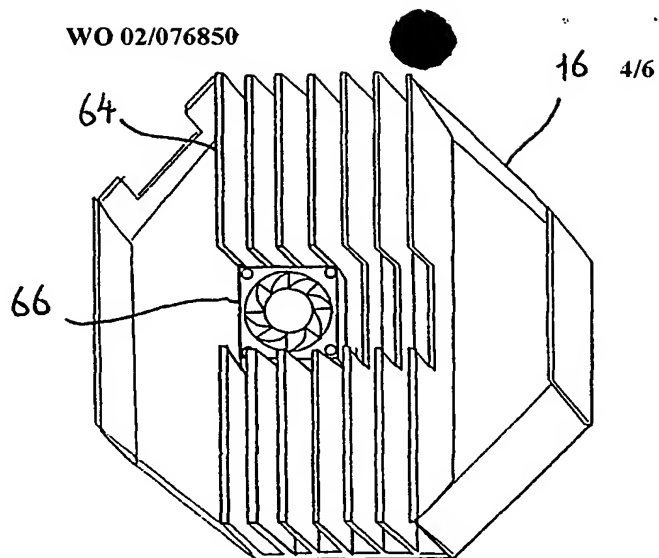


FIG. 7.

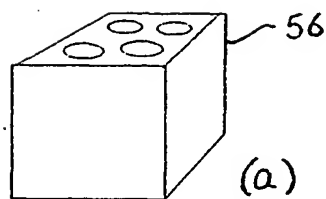
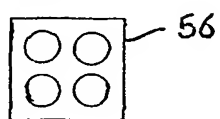


FIG. 9.



(b)

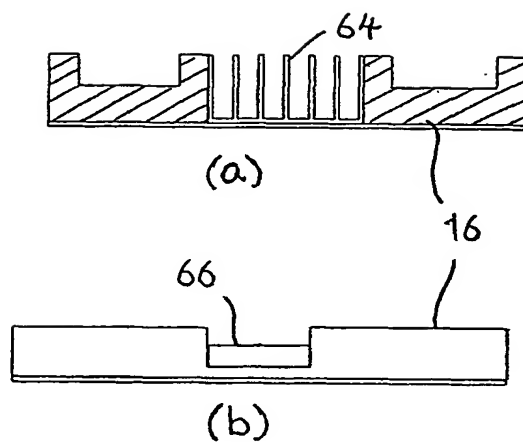


FIG. 8.

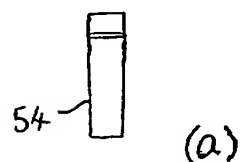
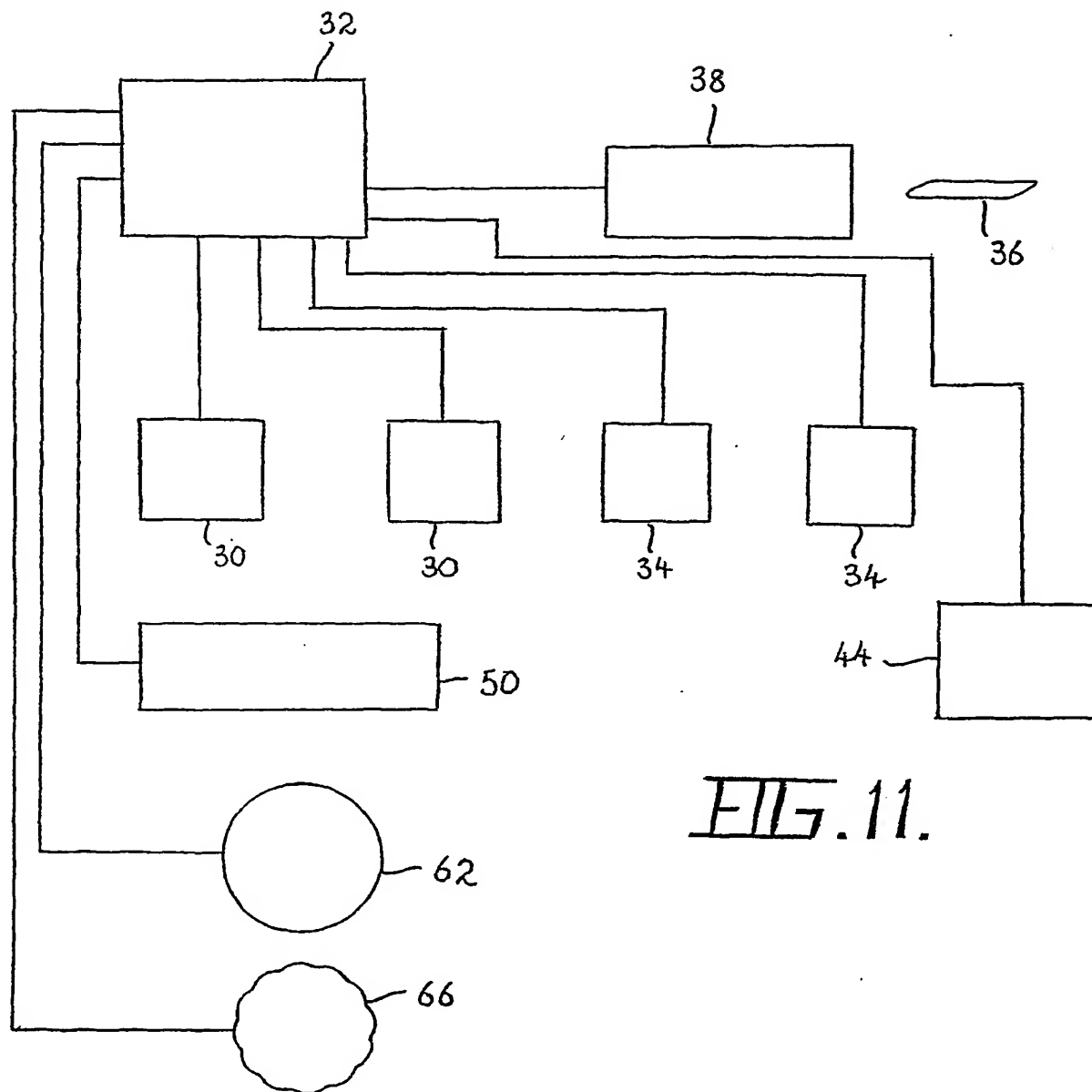
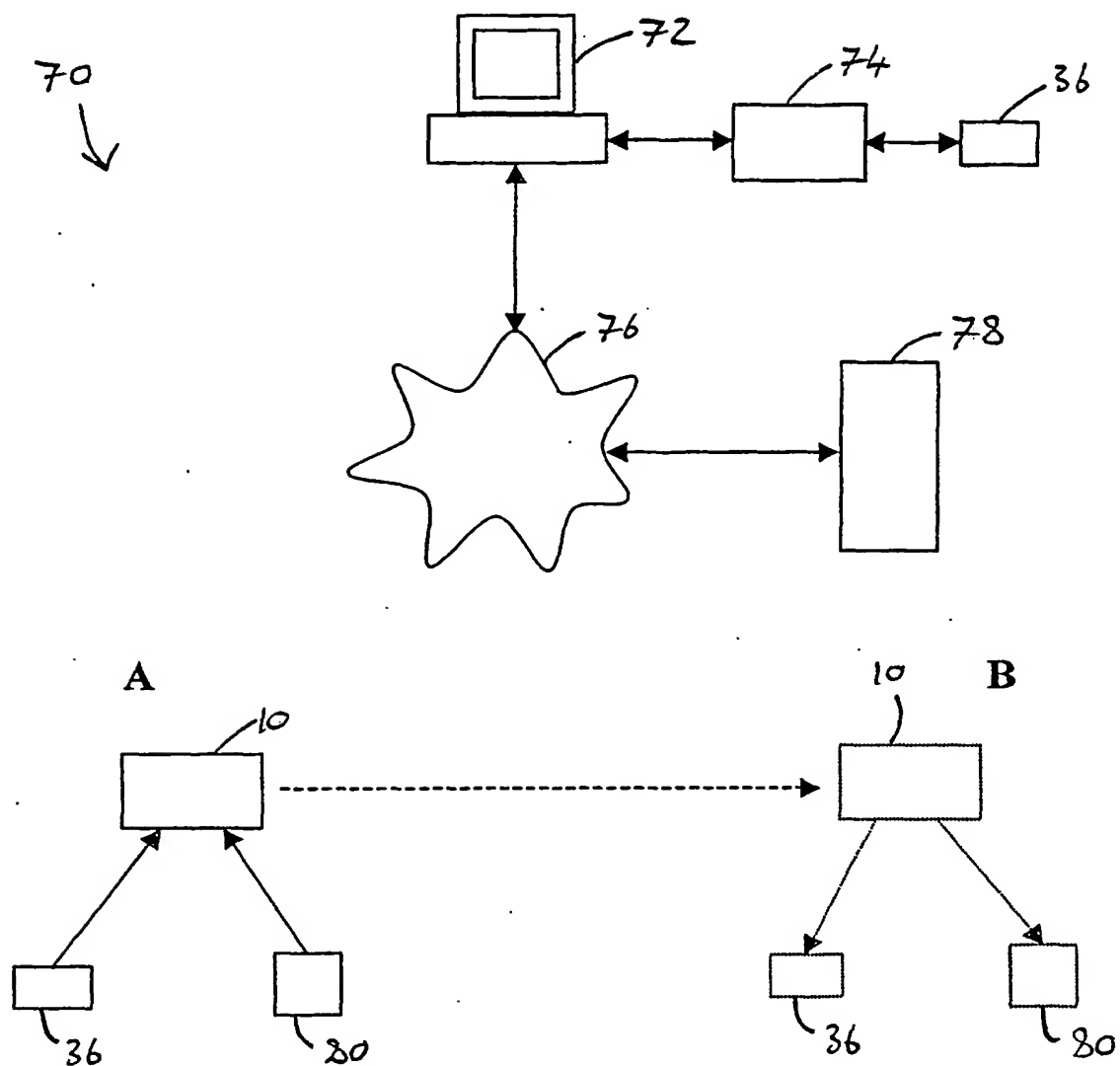


FIG. 10.

*FIG. 11.*

**Fig. 12**

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU02/00359

A. CLASSIFICATION OF SUBJECT MATTER		
Int. Cl. ⁷ : B65D 81/18, 81/20, 81/24, 81/38, 88/12, 88/14, 88/74, 90/48, 101/00, 55/14, A61J 1/14, G06F 3/05		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
Refer Electronic database consulted below		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
DWPI IPC B65D 50/02, 51/24, 55/00, 55/02, 55/14, 81/00, 81/18, 81/20, 81/24, 81/38, 85/00, 85/50, 88/12, 88/74, 90/48, 101/00, A61J 1/00, 1/12, 1/14, 1/16, 1/18, G01D 15/12, G01V 15/00, G01S 5/16, G06F 3/05 & keywords transport, ship, transit, freight, iso, cargo, container, chamber, box, case, sensor, monitor, measure, parameter, value, temperature, humidity, write, read, record, memory, cpu, processor, lock, keypad, tamper, code, open, access & others		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1055987 A (TABUENCA GARCIA) 29 November 2000 see especially figure 1 and paragraph 22	1, 2, 4-8, 15-20, 26-29
A	US 5285657 A (BACCHI ET AL) 15 February 1994 see abstract	1-33
A	US 5476763 A (BACCHI ET AL) 19 December 1995 see abstract	1-33
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
Date of the actual completion of the international search 27 June 2002	Date of mailing of the international search report 03 JUL 2002	
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929	Authorized officer M.S. HAYNES Telephone No : (02) 6283 2170	

Form PCT/ISA/210 (second sheet) (July 1998)

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 01/08983 A (THERMAL PRODUCTS INC) 8 February 2001 see abstract	1-33
A	US 5615625 A (CASSIDY ET AL) 1 April 1997 see abstract	1-33
P, A	US 2002/0004724 A (EASTMAN) 10 January 2002 see abstract	1-33
P, A	US 2002/0023441 A (BARA ET AL) 28 February 2002 see abstract	1-33

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
EP	1055987	ES	1043420	ES	2166262
US	5285657	AU	84651/91	CA	2052439
		FI	914528	FR	2667297
		NO	913771	NZ	239961
		US	5476763	ZA	9107746
US	5476763	AU	84651/91	CA	2052439
		FI	914528	FR	2667297
		NO	913771	NZ	239961
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US	2002/0004724	AU	200171859	WO	200202431
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		WO	200033005		
				EP	479635
				JP	6080503
				PT	99069
				EP	479635
				JP	6080503
				PT	99069
				EP	692599
				FR	2786876
END OF ANNEX					